MTBE Case Study
Air Sparging/Soil Vapor Extraction at
Eaddy Brothers, Hemingway, South Carolina

Site Name: Eaddy Brothers

Site Location: Hemingway, SC

Contaminants: MTBE, BTEX, Naphthalene

Media: Groundwater

Technology: Air Sparging/Soil Vapor Extraction (SVE)

Technology Scale: Full

Type of Cleanup: RCRA UST

Period of Operation: July 1999 - present (data available through August 2000)

State Contact:
Read S. Miner, P.G.
Hydrogeologist
South Carolina Dept. of Health and Environmental Control
2600 Bull St.
Columbia, SC 29201
Telephone: (803) 898-4350
Fax: (803) 898-4330
E-mail: minerrs@columb26.dhec.state.sc.us

Contractor:
Consultech Environmental, Inc.
1800 MacLeod Dr., Suite F
Lawrenceville, GA 30043
Telephone: (678) 377-0400
Fax: (678) 377-0051
www.consultechenv.com

Site History [1,2]:

Eaddy Brothers is a gasoline service station located in Hemingway, South Carolina. In September 1998, a release was reported from the station's underground storage tanks (USTs). Initially, the local fire department was dispatched in an emergency response because of gasoline vapors that had accumulated in a storm sewer underlying downtown Hemingway. Soil and groundwater at the site were found to be contaminated with MTBE, BTEX, and naphthalene, and free product was present in the groundwater. Data from October 1998 showed concentrations of contaminants in groundwater as high as 5,110,000 ug/L for MTBE, 226,000 ug/L for benzene, 301,000 ug/L for toluene, 280,000 ug/L for ethylbenzene,

278,000 ug/L for xylene, and 2,700 ug/L for naphthalene. A Corrective Action Plan (CAP) was implemented in July 1999 under Subtitle I of the RCRA program. The CAP included free product recovery and treatment of dissolved-phase groundwater contamination using air sparging/SVE.

The soil at the site consists of silty clays with inter-fingered thin clayey-sand lenses. No confining units have been identified at the site. The average hydraulic gradient is 0.005 feet/feet with a calculated seepage velocity of 0.138 feet per year. The depth to groundwater is 2.5 to 17.9 feet below ground surface (bgs).

Technology Description [1,2,4]:

In July 1999, an air sparging/SVE system began operating at the site. The SVE portion of the system consists of approximately 230 feet of horizontal SVE piping installed immediately below the asphalt parking lot surface of the site. The piping is connected to a 20 HP Lamson Blower operating at 12 to 14 inches of mercury. Extracted vapors are treated using a thermal oxidizer. The air sparging portion of the system, which began operating two weeks after the SVE system was activated, consists of ten vertical air sparging wells, each installed at a depth of about 26 feet with 5-foot well screens. The wells are connected to a Kaeser SK-26 air sparge compressor operating at 68 to 70 psi.

There are 28 wells used to monitor groundwater at the site, located on- and off-site of the Eaddy Brothers property.

Technology Performance [1,2,4]:

Site-specific target levels (SSTLs) were established by SCDHEC for MTBE, benzene, toluene, ethylbenzene, xylenes, and naphthalene, with 15 monitoring wells used in setting the SSTLs. Table 1 shows the SSTLs for the individual wells and the total “mass” for each contaminant at the site.

Groundwater data were collected in October 1998 and May 1999 before the system began operating, and quarterly from August 1999 through August 2000, after the system began operating. Table 2 summarizes data on the total mass of contaminants (sum of the concentrations measured in each of the wells listed in Table 1) in the groundwater and the maximum concentration of contaminants measured in an individual well.

Table 1. SSTLs for the Eaddy Brothers Site (ug/L)*[1]

Well No.	Benzene	Toluene	Ethlybenzene	Xylenes	MTBE	Napthalene
RW-1	5	<5	640	53	7	25
RW- 2	5	1,000	700	10,000	40	25
RW-3	5	1,000	700	10,000	40	25
RW-4	5	1,000	700	10,000	40	25
RW-5	5	1,000	700	10,000	40	25
RW-6	5	1,000	700	10,000	40	25
RW-7	5	240	251	500	24	25
RW-10	10	2,000	1,200	4,300	80	50
RW-11	10	2,000	1,000	1,800	80	50
RW-12	10	2,000	1,400	20,000	80	50
RW-13	10	18	20	18	80	28
RW-14	10	660	1,400	1,810	80	50
MW-19	5	<5	<5	<5	<5	<5
MW-20	5	<5	<5	<5	<5	<5
MW-24	96	<5	<5	<5	<5	<5
Total Mass	191	11,938	9,426	78,496	646	418

* The total “mass” for each contaminant at the site was calculated as the sum of the concentrations in the individual wells

Table 2. Data on Contaminants in Groundwater (ug/L) (Total Mass* and Maximum Concentration) [4]

Contaminant	SSTL (Total Mass)	October 1998 Total Mass/ Max Conc.	May 1999 Total Mass/ Max Conc.	November 1999 Total Mass/ Max Conc.	August 2000 Total Mass/ Max Conc.
Benzene	191	1,149,829/226,000	1,370,761/226,000	6,100/1,900	809/401
Toluene	11,938	1,555,938/301,000	1,853,563/301,000	22,637/9,100	2,550/1,550
Ethylbenzene	9,426	1,409,546/280,000	1,686,000/280,000	2,297/600	352/105
Xylenes	78,496	1,415,596/278,000	1,708,837/278,000	26,870/7,200	6,744/3,720
MTBE	646	25,567,302/5,110,000	30,670,325/5,110,000	4,496/1,400	1,390/595
Naphthalene	418	13,917/2,700	18,412/2,930	5,498/1,500	609/228

* - The total “mass” for each contaminant at the site was calculated as the sum of the concentrations in the individual wells

As of August 2000, the total mass and maximum concentrations of MTBE, BTEX constituents, and naphthalene in the groundwater at the Eaddy Brothers site have decreased, with the SSTLs being met for toluene, ethylbenzene and xylenes. Maximum MTBE concentrations have been reduced from 5,110,000 ug/L to 595 ug/L (about 99.99 %), with a reduction in total mass of about 99.99 % (25,567,302 ug/L to 1,390 ug/L). Maximum concentrations and mass of BTEX constituents have been reduced by more than 99%. Naphthalene concentrations have been reduced from 2,700 ug/L to 228 ug/L (about 91%), with a reduction in total mass of about 96% (13,917 ug/L to 609 ug/L).

As of August 2000, the SSTLs had not been met for benzene, MTBE, and naphthalene, and the system will continue to be operated until all SSTLs have been met. According to the contractor, cleanup of the site is projected to be completed by April 2001.

Technology Cost [1,2,3]:

The cost for this application is $197,515. The South Carolina Petroleum Cleanup Fund awarded the contract for the cleanup at this site as a fixed-price, lump sum with no change orders. No additional cost breakdown is available.

Observations and Lessons Learned:

After about a year of operation, the air sparging/SVE system at the Eaddy Brothers site has reduced the total mass of toluene, ethylbenzene, and xylenes to below the SSTLs and has reduced the total mass and maximum concentrations of MTBE, benzene, and naphthalene by more than 90%. The system will continue to operate until all SSTLs have been met, with the site contractor estimating completion of the remediation in April 2001.

References:

1. Art Shrader, SCDHEC. Memorandum to Richard Weisman, Tetra Tech EM Inc. Re. Eaddy Brothers Permit #13850, MTBE Study, Williamsburg County. February 14, 2000.

2. W. Scott McInnis, SCDHEC. E-mail to Richard Weisman, Tetra Tech EM Inc. MTBE Study - Information about Eaddy Brothers. February 25, 2000.

3. Art Shrader, SCDHEC. E-mail to Richard Weisman, Tetra Tech EM Inc. MTBE Study - Cost Data. February 23, 2000.

4. Art Shrader, SCDHEC. E-mail to Doug Maddox, EPA. Feedback on Draft Case Study. October 30, 2000.